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Claims:

1. A method of manufacturing a thin film transistor including an oxide film, the method comprising the oxide film forming
5 step of
immersed a substrate in an oxidizing solution containing an active oxidizing species for direct oxidation of the substrate to form a chemical oxide film, the substrate having a surface on which a chemical oxide film is to be
10 formed.
2. The method of claim 1, wherein
in the oxide film forming step, the active oxidizing species is formed by heating the oxidizing solution or
15 electrolyzing the oxidizing solution.
3. The method of either one of claims 1 and 2, wherein in the oxide film forming step,
the substrate is immersed in the oxidizing solution of
20 different concentrations, and
the concentration of the oxidizing solution is altered from a low-concentration oxidizing solution to a high-concentration oxidizing solution.
- 25 4. (Amended) The method of claim 3, wherein:

the low-concentration oxidizing solution has a lower concentration than an azeotropic concentration; and

the high-concentration oxidizing solution has a concentration more than or equal to the azeotropic
5 concentration.

5. (Amended) The method of either one of claims 3 and 4, wherein

in the oxide film forming step, the low-concentration
10 oxidizing solution is concentrated to prepare the high-concentration oxidizing solution.

6. The method of either one of claims 1 and 2, wherein

in the oxide film forming step, the chemical oxide film is
15 grown on the substrate surface by applying voltage to the substrate on which the chemical oxide film is to be formed.

7. The method of any one of claims 1 to 6, wherein

the substrate on which the chemical oxide film is to be
20 formed contains, on the surface, at least one component selected from the group consisting of monocrystal silicon, polycrystalline silicon, amorphous silicon, continuous grain silicon, silicon carbide, and silicon germanium.

25 8. The method of any one of claims 1 to 7, wherein

the oxidizing solution contains: at least one solution selected from the group consisting of nitric acid, perchloric acid, sulfuric acid, ozone-dissolving water, aqueous hydrogen peroxide, a mixed solution of hydrochloric acid and aqueous hydrogen peroxide, a mixed solution of sulfuric acid and aqueous hydrogen peroxide, a mixed solution of aqueous ammonia and aqueous hydrogen peroxide, a mixed solution of sulfuric acid and nitric acid, aqua regia, and boiling water; a gas thereof; or a mixed solution thereof.

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9. (Amended) The method of claim 8, wherein

the oxidizing solution is an azeotropic mixture.

10. The method of claim 9, wherein

15 the oxidizing solution contains at least one solution selected from the group consisting of azeotropic nitric acid which is an azeotropic mixture with water, azeotropic sulfuric acid which is an azeotropic mixture with water, and azeotropic perchloric acid which is an azeotropic mixture with
20 water.

11. The method of any one of claims 1 to 10, wherein

the oxide film forming step is carried out at 200°C or lower temperatures.

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12. The method of any one of claims 1 to 11, further comprising, after forming the chemical oxide film, the step of forming an insulating film on the chemical oxide film.

5 13. (Amended) The method of either one of claims 1 and 2, wherein

the oxide film forming step comprises the steps of:

immersing the substrate in an oxidizing solution below azeotropic concentration to form a first oxide film; and

10 concentrating the oxidizing solution below azeotropic concentration up to or in excess of an azeotropic concentration with the substrate being immersed in that oxidizing solution to form a second oxide film on the first oxide film.

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14. The method of claim 7, wherein

the substrate on which the chemical oxide film is to be formed contains silicon carbide on the surface.

20 15. The method of claim 8, wherein

the oxidizing solution is nitric acid.

16. The method of any one of claims 1 to 15, further comprising, after the oxide film forming step, the step of
25 subjecting the chemical oxide film(s) to nitriding.

17. A thin film transistor manufactured by the method of any one of claims 1 to 16, comprising the chemical oxide film formed by oxidation in an oxidizing solution.

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18. A thin film transistor of claim 17, wherein the chemical oxide film has a relatively high atomic density near the substrate.

10 19. The thin film transistor of either one of claims 17 and 18, wherein

the chemical oxide film is a gate oxide film.

15 20. A display containing the thin film transistor of any one of claims 17 to 19.

21. A method of modifying an oxide film, comprising the step of

20 performing the oxide film forming step of any one of claims 1 to 16 on an oxide film having a non-uniform thickness to improve quality of the oxide film.

22. A method of modifying an oxide film, comprising the step of

25 performing the oxide film forming step of any one of

claims 1 to 16 on an oxide film having non-uniform quality to improve the quality of the oxide film.

23. (Amended) A method of forming an oxide film, comprising
5 the steps of:

bringing a semiconductor in contact with an oxidizing solution below azeotropic concentration or a gas thereof to form a first chemical oxide film on a surface of the semiconductor; and

10 bringing the semiconductor on which the first chemical oxide film is formed in contact with an oxidizing solution of or in excess of azeotropic concentration or a gas thereof to form a second chemical oxide film.

15 24. A method of forming an oxide film, comprising the steps of:

reacting an oxidizing solution of a low concentration or a gas thereof with a surface of a semiconductor to form a first chemical oxide film on the surface of the semiconductor; and

20 reacting an oxidizing solution of a high concentration or a gas thereof to form a second chemical oxide film on the first chemical oxide film.

25 25. The method of either one of claims 23 and 24, wherein the step of forming the second chemical oxide film is

carried out while the oxidizing solution used to form the first chemical oxide film is being concentrated.

26. The method of any one of claims 23, 24, and 25, wherein
5 the second chemical oxide film is formed so that the second chemical oxide film is thicker than the first chemical oxide film.

27. The method of any one of claims 23 to 26, wherein
10 the step of forming the first chemical oxide film and the step of forming the second chemical oxide film are carried out with the semiconductor being immersed in the oxidizing solution.

15 28. The method of any one of claims 23 to 27, wherein
 the semiconductor contains at least one component selected from the group consisting of monocrystal silicon, polycrystalline silicon, amorphous silicon, silicon carbide, and silicon germanium.

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29. (Amended) The method of claim 24, wherein
 the oxidizing solution of a high concentration or a gas thereof is an oxidizing solution of or in excess of azeotropic concentration or a gas thereof.

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30. The method of any one of claims 23 to 29, wherein

the oxidizing solution or the gas thereof contains: at least one solution selected from the group consisting of nitric acid, perchloric acid, sulfuric acid, ozone-dissolving water, aqueous hydrogen peroxide, a mixed solution of hydrochloric acid and aqueous hydrogen peroxide, a mixed solution of sulfuric acid and aqueous hydrogen peroxide, a mixed solution of aqueous ammonia and aqueous hydrogen peroxide, a mixed solution of sulfuric acid and nitric acid, aqua regia, and boiling water; a gas thereof; or a mixture thereof.

31. (Amended) The method of claim 24, wherein:

the oxidizing solution of a low concentration or the gas thereof contains: at least one solution below azeotropic concentration selected from the group consisting of an aqueous solution of nitric acid, an aqueous solution of sulfuric acid, and an aqueous solution of perchloric acid; or a gas thereof; and

the oxidizing solution of a high concentration or the gas thereof contains: at least one solution of or in excess of azeotropic concentration selected from the group; or a gas thereof.

32. The method of any one of claims 23 to 31, further comprising, after forming the chemical oxide films on the

surface of the semiconductor, the step of subjecting the chemical oxide films to nitriding.

33. A method of manufacturing a semiconductor device,
 5 comprising the oxide film forming step of
 forming a chemical oxide film by the method of any one
 of claims 23 to 32.

34. A method of manufacturing a semiconductor device,
 10 comprising the steps of:
 reacting an oxidizing solution of a low concentration or a
 gas thereof with a surface of a semiconductor to form a first
 chemical oxide film on the surface of the semiconductor; and
 reacting an oxidizing solution of a high concentration or
 15 a gas thereof to form a second chemical oxide film on the first
 chemical oxide film.